Special Topic: Injury Prevention

Geriatric Trauma Care: Challenges Facing Emergency Medical Services

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INTRODUCTION

As the life expectancy of the U.S. population continues to increase, the number of active and at risk geriatric trauma patients will continue to grow. This growth in geriatric trauma patients will present a greater and more challenging problem for trauma systems and emergency departments to manage. Research in the field of geriatric trauma care is slowly gaining more importance, yet many unanswered questions remain. A review of the geriatric trauma literature from 1966-1999 done by the Eastern Association for the Surgery of Trauma found that the majority of the conducted research was retrospective in nature. The lack of prospective randomized trials makes it hard to draw firm evidence-based recommendations to improve the geriatric trauma system of care.[1] It remains difficult to perform rigorous randomized and prospective studies that would lead to better decision-making in the care of the older trauma patient. In this review, we would like to examine recent literature and summarize a few of the main issues facing the geriatric trauma patient, the trauma systems, and the trauma-care providers.

Scope of Problem

From 1993 to 2003 life expectancy in the U.S. increased from 75.5 years to 77.6 years.[2] This increase, along with the surge of baby boomers, is projected to double the 65-year-old and over U.S. population from 35 million to about 72 million (20% of total population) over the next 20 years.[3] Among the states with the largest geriatric population, California leads the way with an estimated 3.6 million in the year 2000. Los Angeles County, Orange County, and San Diego County are among the top 10 counties in the United States with the largest geriatric populations.[3] While younger age groups have shown a decrease in the numbers of trauma registry records, a study looking at data from the New York State Trauma Registry from 1994-1998 showed a 17.6% increase in trauma registry records for 75-85 year olds.[4]

The three most common causes of geriatric trauma include falls, motor vehicle collisions, and pedestrian-related collisions.[5] Falls continue to be the number one cause of geriatric trauma with increasing fatality rates. A recent CDC report showed that during the 10-year period of 1993-2003, fatality rates for geriatric falls increased 45.3% and 59.5% for men and women respectively.[2] Motor vehicle collisions and pedestrian-related injuries involving the elderly also continue to increase with the growth of the geriatric population. A study done by Lymann et al. projects older-driver crash involvement to increase by 178% and fatalities to increase by 155% by 2030.[6] These statistics point to a continued need to develop and enact prevention strategies that target senior citizens and their risks of injury due to falls and motor vehicle collisions.

Management and care of the injured geriatric patient is challenging. National vital statistics reports show that geriatric trauma victims, 75-85 years old and older, have the highest death rates (86.1 to 296.6 deaths per 100,000).[7] Studies have shown that compared to younger trauma victims, geriatric trauma victims not only have greater morbidity and mortality, but also have longer hospital stays and consume more hospital resources at the same injury severity scores.[8-10] Reasons for these differences include a higher number of co-morbidities, lower physiological reserve, under triage, and lack of trauma center care. While it is difficult to specifically identify one

variable that will dramatically improve the care of the geriatric trauma patient, understanding how the different factors work together and creating prevention programs are essential.

Trauma Regionalization

There is still no strong consensus regarding the effect of trauma center care on geriatric trauma outcomes. Some studies have shown improved outcomes for geriatric patients in trauma centers versus those cared for in non-trauma centers. Smith et al. looked at trauma patients older than 55 with femoral shaft fractures and found that complication rates at trauma centers were 35%, compared to 47% at non-trauma centers.[11] Another study looked at trauma in the very elderly defined as older than 80. The authors found that in the severely injured cohort, defined as an injury severity score (ISS) 21-45, the difference in survival rates at trauma centers (56%) versus that at non-trauma centers (8%) was statistically significant.[12] Mann et al. studied the geriatric population (>65 years old) for five years preceding the implementation of the Washington state trauma system and for three years during the construction of the system. They found a 5.1% improvement in 60-day survival among severely injured older persons, defined by an ISS score of greater than 15.[13] There are still many obstacles in generalizing these study findings. Many of these studies suffer limitations in the variability of the datasets used for analysis, different outcome measures, and different patient populations and trauma system characteristics. Clearly more research is needed in this area to examine which components of a trauma system improve outcomes for geriatric trauma victims.

Despite questions concerning which components of the trauma system improve outcomes in older adults, there is a strong consensus regarding the positive effect of the regionalized trauma system for trauma victims in general. Implementation of a regionalized trauma system has been shown to drastically decrease mortality and preventable deaths. This was demonstrated in early studies after Orange County, California instituted its trauma system.[14,15] In a more recent study, data from the National Trauma Data Bank (NTDB) was used to show improved outcomes at Level I trauma centers as compared with Level II and other non-trauma centers in cardiovascular injuries, high-grade liver injuries, and complex pelvic fractures. Level I trauma centers had lower mortality rates (OR=0.81 with 95% CI: 0.71-.94) and lower rates of severe disability at discharge (OR=0.55 with 95% CI: 0.44-0.69) compared with Level II and other non-trauma centers.[16] Another national evaluation used data from the National Study on the Costs and Outcomes of Trauma (NSCOT) to assess mortality in Level I trauma centers versus that in non-trauma centers. Mackenzie et al. found that after adjusting for differences in patient populations, there was a 25% reduction in risk of death from more severe injuries when care was provided at a Level I trauma center.[17] This study also looked at outcomes of geriatric trauma patients; however, they did not show significant differences. This was likely due to small numbers of geriatric patients with severe injuries.

Triage Guidelines

Studies showing poorer outcomes in the geriatric trauma population compared with the non-geriatric trauma population prompted the American College of Surgeons Committee on Trauma (ACS-COT) to issue a series of guidelines.[18] In its manual "Optimal Resources for the Care of the Trauma Patient," they recommend that trauma patients older than 55 be directly triaged to trauma centers regardless of injury severity. In order to reduce the morbidity and mortality in the geriatric trauma population, other researchers have also recommended that geriatric trauma victims be triaged at lower thresholds than non-geriatric trauma victims.[8] However, studies suggest that there are high rates of under triage in the geriatric trauma population.[19-21] One study specifically looked at the Florida trauma system over a 14-year period (1991-2003) and noted that the elderly population (greater than 65 years old) experienced the smallest increase in the rate of triage to designated trauma centers and was more likely to be managed at a non-trauma center. Simultaneously, the elderly population experienced an increased rate of injury-related hospitalization and mortality during the same period. The authors advocated for better triage guidelines for geriatric trauma victims so that they are directed to appropriate treatment facilities and experience improved outcomes. Incidentally, the data from this study also showed that adults and children were more likely to be triaged to appropriate facilities than were the elderly.[22]

The etiology for under triaging geriatric trauma patients is not clear. One possible reason may be the inadequacy of the underlying triage criteria in identifying potentially sick geriatric victims. One retrospective analysis evaluated the ability of Florida's triage criteria to identify geriatric trauma victims when linked with statewide hospital patient discharge database. The database included 16,432 cases over a six-month period and included 3,980 geriatric cases. Using Florida's trauma scorecard triage criteria, the study compared the number of patients retrospectively deemed major geriatric traumas and compared that to the actual number of major geriatric trauma cases. The study found a 71% under-triage rate among geriatric trauma victims (older than 55) compared with a 36% rate of under triage in a younger adult population (under 55 years old).[23]

Another possible reason for under triage is lower compliance in following pre-hospital triage protocols. A retrospective study of Maryland's statewide pre-hospital

ambulance data (32,950 transports) evaluated three criteria for trauma transport: injury, mechanism, and physiology. Geriatric trauma patients (older than 55) who met only the physiology criterion had a 23.9% triage compliance compared with 40.3% for younger patients (younger than 55 years old). The injury and mechanism triage criteria had higher rates of compliance and did not show any age-related differences.[20] The standards for assessing physiology criteria in the pre-hospital protocols should be further investigated for ways to improve pre-hospital personnel evaluation and compliance with these protocols.

Regardless of the etiology of under triage of geriatric trauma patients to appropriate trauma centers, the result is that severely injured geriatric patients are not receiving trauma center care with the same frequency as their younger counterparts. Lane et al. examined Pennsylvania's acute injury discharge data. Out of 9,980 patients suffering a severe injury, they found that 36% of elderly patients with ISS scores greater than 15 received trauma center care compared with 46.7% of younger patients with similar scores.[24]

The geriatric trauma patient presents a challenge to pre-hospital EMS providers. Making triage decisions for patients with increased co-morbidities, longer medication lists and different physiological reserves is difficult compared to similar decision-making in younger trauma patients.[25] Also, different states have varying pre-hospital trauma triage guidelines. Some states include age as a decision-making criterion while others do not. Failure to include age likely makes under triage of the geriatric trauma patient more common.[19] Whatever the case, more research needs to be undertaken to create better guidelines and pre-hospital triage criteria to help identify injured geriatric trauma patients who could benefit from trauma center care.

The question of whether to triage all geriatric trauma patients older than 55 to trauma centers regardless of injury severity remains a controversial one.[1] Issues of over triage, increased healthcare system costs and inefficient use of the trauma system resources are some of the barriers in implementing this protocol. One study looked at the Canadian regionalized trauma system in Quebec during 1993-2000. This study showed a gradual increase in the utilization of their Level I trauma centers. Part of the increase was attributed to following the recommendations of the ACS-COT, in which all geriatric trauma patients are triaged to trauma centers. This could lead to a high proportion of geriatric trauma patients with low injury severity being seen at the Level I trauma centers, consuming more resources.[26] More studies should be undertaken to evaluate better guidelines for transfer of geriatric trauma patients to appropriate care facilities in order to improve outcomes and optimize utilization of the regionalized trauma systems.

Trauma Care and Outcomes

There have been numerous retrospective studies using trauma registry and trauma center data to evaluate geriatric trauma patient outcomes. These studies have shown that outcomes after injury in the geriatric trauma population, generally defined as over 65 years old, have been poor. In geriatric trauma involving rib fractures, two studies have reported that the risk of death is 2-5 times greater than that of a younger patient cohort, even after adjusting for injury severity and other co-morbidities.[27,28] One study looking at longer term mortality showed mortality rates of roughly 36% about two years after the traumatic incident (ISS greater than 15) in older patient groups, compared with roughly 7% mortality in younger patients.[29,30] In another study, Inaba et. al. looked at quality-of-life indicators measured through a standardized health survey and found that geriatric trauma patients experienced negative effects in their social, physical and emotional health status, as well as loss of independence.[30]

Even with poorer outcomes after injury in this population, an aggressive treatment approach has been recommended to improve long-term outcomes.[31-33] However, there are few studies that actually investigate the specific interventions that accomplish better long-term outcomes. A review by the Eastern Association of Surgery Trauma recommended invasive hemodynamic monitoring using a pulmonary artery catheter for geriatric trauma patients meeting certain criteria.[1] However, as stated in that review, this recommendation was based on one study done over 10 years ago with limitations in the methodology. In an effort to improve trauma team activation (TTA) criteria and avoid missing patients who might benefit from TTA care, Demetriades et. al recommends trauma team activation for all geriatric trauma patients older than 70 admitted to trauma centers.[34] In one study, Demetriades et al. looked at older trauma victims before and after a protocol revision was instituted to include early advanced hemodynamic monitoring, tissue perfusion monitoring, and early surgical intensive care unit admissions. After adjusting for injury severity, age, gender, and mechanism of injury, they found a decrease in the overall mortality from 53.8% to 34.2% (P=0.003) in the population that received revised protocol care compared with those that received care prior to protocol revision.[35] However, rates of permanent disability among survivors did not show statistically significant improvement. In addition, given the study design, it is difficult to show what specific aspects of the trauma care led to the decrease in mortality outcomes.

CONCLUSION

The presence of increasing numbers of geriatric trauma patients presenting to trauma centers and emergency departments will continue to drive the need for better protocols for triage and treatment of this population. In addition to better management of the geriatric patient, prevention programs that

address risks for falls and older-driver fitness issues need to be better incorporated into the care of geriatric patients seen in the emergency department and by primary care providers. Utilization of trauma registry data in evaluating trauma systems, care and outcomes has provided many associations and correlations of injury characteristics and various outcome measures. These studies have raised interesting questions and elucidated problems within the current system of geriatric care, but it remains difficult to draw strong evidence-based recommendations from these observational studies. Areas that need further study include specific aspects of trauma prevention, trauma system care, pre-hospital triage guidelines, and trauma interventions that improve both short and long-term outcomes. The need for well-designed prospective studies elaborating on previous study findings remains great in order to better understand the geriatric trauma population and improve care.

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